MYTHS AND BENEFITS OF WIND ENERGY WEBINAR

July 20, 2011

Coordinator: ...you for standing by. At this all participants will be on listen-only mode. During the - today's conference is being recorded. If you have any objections, please disconnect at this time.

Now I would like to introduce your host, Mr. Ian Baring-Gould from NREL. You may begin sir.

Ian Baring-Gould: Hello everybody and thank you to a warm July presentation or Webinar from Wind Powering America. We have a very good Webinar today. I'm very excited about it. Really addressing the myths and benefits of wind energy. Though in truth we're really going to focus on some of the myths today with the next couple of presentations over the next couple of months really addressing the benefits to wind technology as we see it.

So today we're going to talk - I'm going to give an overview presentation about a number of the myths that we see commonly out there. Then we're going to be followed by Ed DeMeo to talk about the integration of wind and addressing some of those myths that we see. And then Ben Hoen is going to talk about issues related to wind and nearby property values, some recent work that he has updated from his very well know work on this topic.

And then over the next couple of months we're going to be addressing some of the other myths or some of the other benefits primarily with jobs and economic development on the next one; talking about some offshore that we see and then wildlife in October.

You saw it on the last slide but as typically the questions are done using the Web Meeting. And if you go up to the top of your bar, there's a Q&A section. Hit on that and that allows you to type in a question that you might have for one of the speaker. And at that point it will appear on our screens and we'll do the questions at the end of the session.

So again, if you have a question at any time during the presentations, please go up and hit Q&A and type in your questions and we'll get to as many as we can.

So thank you again for coming. Here's our contact information. So if you have any questions about upcoming Webinars or ideas for future Webinars, please don't hesitate to contact us. And then (Sue) if you can jump us into my next presentation.

What I'm going to do here is go quickly over a number of the myths and benefits that we hear commonly in talking about wind technology. Hopefully the next slide is going. But first what I'm going to quickly address is that in a number of stakeholder meetings that we had over the fall, we listed a whole series of issues relating to wind turbine (unintelligible).

And these are listed here and all of these are things that were identified that are kind of slowing the market for wind technology. And as we can see, there's a whole bunch of different issues here.

What we're really focusing on today is the public acceptance, education, understanding of the public and environmental organizations. That ends up being all of you understanding why it makes sense to do wind and when it doesn't make sense to do wind. And so the myths that we are talking about

here really affect this first major issue that we have seen in the wind energy development marketplace.

So just to start off the conversation, there's a bunch of myths that are out there in regards to wind energy and almost all of these we are going to go through today either by myself or with Ed or Ben addressing kind of specific issues.

But I think it's pretty important to kind of look at these things that you see on the right side of your screen. So as with most things that we certainly see, there are very strong beliefs across the industry. And the wings of the kind of spectrum are usually the most extreme. So a lot of people are very supportive of wind or not a lot of percentages are supportive of - percentage is very opposed.

And the issue is that it's 80 to 90% that's in the middle and the key is we have to provide good information to these people so that they can make informed and educated decisions about whether wind makes sense for their community.

Another thing that I think is important to keep in mind is that people have commonly referred to anybody who disagrees with the idea of wind as a NIMBY. And I think we really need to be moving away from that kind of a term because it really doesn't reflect the reality of - or the complexity of the market issues that we have. And there are real issues that we need to include and consider.

Another problem that we certainly see with myths is a lot of them are fact based. And so the problem is how do you get the real answer out there. And the real answer is typically not as clear or as convenient or as easy. And so it's very easy for people out there to obfuscate the issues.

And then the last part that I think is important for all of us to understand is this very strong desire to provide a balanced perspective. But I think we also need to keep in mind that the views and the percentage of people for or against the wind technology in this specific case are not necessarily equal. And I think that Fox Island main project is a very good example.

So although we do need to keep kind of a balanced perspective as we go forward, we also need to understand that it's not necessarily a balanced discussion. So hitting some of the huge myths that we see out there, wind energy is more expensive is clearly one of them.

The knowledge that's out there and the market report that (Ryan) and (Mark) produce every year which will have a Webinar coming on soon to cover the most recent report that was just recently released and can be obtained on their Web site that clearly shows that in today's market generally speaking wind is more expensive than wholesale power prices.

So we see for the different regions of the country and the total U.S., these are projects in the last year. The yellow dots represent specific projects and the red bars the average and the blue bar is the wholesale power prices in those specific markets. So clearly you can see that current market prices wind is more expensive at today's current prices.

So as I said, every myth has some basis in fact. But we really need to look at the longer term. And so when we start looking at things like any new power generation and all power - new power generation is expensive. The long-term fuel prices including fuel price variability and then the potential increased cost that we see due to emissions or potentially carbon.

And I think the graphic that you see here which comes from testimony in front of the Oklahoma Commission on a specific wind projects that's being put in place, the (cross routes) wind project about the middle of - this time last year. It looked at a whole bunch of different technologies; coal at a couple of different prices, natural gas at a couple of different prices, nuclear at a couple of different prices.

And what we really want to pay attention to is the kind of lower parts of the bar, the first three things which basically show that all of the conventional technologies when we look at new technology costs in the order of $80 per megawatt hour excluding carbon. And the upper parts of those bars represent the carbon costs at various prices.

But even without carbon taking into account, the cost of wind even without the PTC is still lower than all of the conventional technologies that are out there. And so looking at power costs long term and things like that end up being critically important as we go forward.

Another huge thing that we hear is wind energy requires huge government subsidies to be able to work; and although clearly the PTC and the ITC have been a major (impacter) of the market and we see here in the AWEA graphic what happens when (we don't see) PTC in place.

And then certainly the 1603 cash grant has really kept the market going through the recession. The idea of a subsidy or an incentive needs really to be taken into context. And the reason we have subsidies or incentives in the marketplace is if we want to change the market and certainly one could say that without incentives for oil or coal we would probably all still be burning wood in our homes.

And anytime you have a major market player who does not have an interest in the market changing, the way the government helps motivate that change is through an incentive that allows other technologies that could be better or have other benefits to play a role.

I think incentives like the PTC also provide an equal playing field. And two studies in the last year really show the potential impact of coal on the environment and on human health. So 27 cents per kilowatt-hour impact of coal based on this study.

It's not subsidy but that's 27 cents that all of us are paying in one way or another and it's not necessarily as a government handout or something of that nature but it's a cost that all of us are paying with coal now does not need to pay.

And then looking at the health impacts of coal alone, 13,000 coal related deaths per year and the economic impact of $102 billion per year. Again, it's not a subsidy but it's an impact that all of us pay one way or another.

And then we also have to look at the subsidies for other energy technologies. The Price-Anderson Act is a very interesting one. The Price-Anderson Act basically indemnifies all nuclear power plants from any kind of accident and says that the U.S. taxpayer is going to cover that bill.

Fukushima is a case in point. It's certainly not us but that accident is going to go into the tens of billions of dollars that in that case the Japanese taxpayer is going to have to assume. And if anything of that nature happened in the United States the U.S. taxpayer would be assuming that bill as well.

And then also we have to look at the role of subsidies. So coal and oil have received subsidies since the 20s. And even though right now their subsidy is lower than what we get for wind through the PTC, there's a question of whether we really should be subsidizing technologies for that long.

Another clear myth that we see looking out on the Web is that the only reason we're deploying wind is because of an overreaching government mandate to do it. And I think it's really important to - for all of us to understand that one of the real drivers for wind is renewable portfolio standards that are based on a state-by-state basis. And the only reason those get put in place is because the people of those states want it.

So in a sense yes it is a government drive to put in renewable technologies but we are our governments and therefore what we see our governments doing is just following the will of the people in putting in wind. And it's not some conspiracy that's moving this forward.

The idea that wind in truth has no local economic benefit, something that I think again and again has been proven to be false by a bunch of different studies.

But I'm sure you can point to a project where it could be the case only because the negotiations between the company putting in the wind project and the local communities were not very supportive of the local communities because the local communities didn't know what they were doing, didn't have the resources to understand it and therefore didn't write a good contract.

But in almost all of the cases we clearly see huge local benefits to communities that understand the value that their land has and can work with the wind developers to actually put that land to use in wind generation.

But tons of construction jobs, $40 million as an example in Colorado, lots of local spending long term in this one analysis done using the JEDI model looking at about $7.6 million per year for 1000 megawatts in Colorado.

Another thing that we see along these same lines is everybody saying that all the wind turbine components are imported from Europe so we have no kind of domestic manufacturing of wind and therefore it's as bad as buying oil from the Far East.

Again untrue according to the market report. About 60% of all wind turbines now are domestically produced. And in some cases companies are approaching 80%. So a huge shift in the last number of years.

And then I think also looking at the idea that because most of U.S.'s energy from an electrical perspective is from coal and natural gas that even putting in wind doesn't help net imports or exports of energy sources. Again, something that's not true.

We see almost $2 billion being sent out of the country to buy coal from foreign entities in 2008 alone. And then looking at within the state, something that's much more known, 11 states imported over $1 billion of coal from other states. And again, that's money that's leaving the local economy to fund an energy source that's imported. So clearly we see economic benefit to the states.

Smaller projects are not economic. Kind of following on the same theme. Again, the smaller projects do cost more because we don't get the economies of scale. But it's really based on the community and what the local economics are.

And two cases in Alaska primarily Kodiak and (Kiscuic) clearly demonstrate that small wind projects can have huge economic benefits to local communities when it's done properly.

Sound and noise. Again, another myth that we see out there and again a quasi myth. Lots of people have probably seen the graphic on the right that ten to simplifies issues with wind and noise. And in truth, noise - anybody's whose been around a turbine knows that wind turbines do make noise and that that noise can have an impact. And so it needs to be taken seriously.

But clearly we see this issue overblown in many cases. So there are international standards in regards to the noise that wind turbines can make. And then doing the analysis of noise for a particular turbine or a particular wind project is very common and happens quite - is a standard part of the development process.

But it's clearly not the whole story. And so relative - or noise levels relative to the background noise, individual noise sensitivity, there's a huge variety in how noise impacts individual people. Understanding the differences between average noise and instantaneous noise levels.

And then certainly question the validity of some of the models in very complex terrain or in things of that nature and not a lot of work has been done to verify all models in very complex terrain.

What we certainly do know is that some people find the wind very annoying, the noise of wind very annoying. And that can lead to (unintelligible). And so we need to take that seriously.

(Unintelligible) a question of how this is different from any other development and why if a community has a noise - some sort of noise standard that is used generally why wind would be considered any different than any other type of development in regards to that noise.

And I think it's still important to understand that there is no accepted direct health link. And although research is needed to kind of move this forward, people are still not able to identify the direct health impacts and prove that in real scientific cases.

Lastly, before we move on to our other speakers, I think we do really need to take this in context. And so the idea of being able to turn off our lights and go back to the horse drawn car is not something that our society is going to.

So although we do need to think about all of the impacts of energy development and wind in specific, we do need to think about it in context with the other technologies that are out there and the impacts that we see from the other energy choices that we have at our disposal.

This year probably the only one that needs a little bit of description but this is that a radiological studies of Fukushima plant and anything that you see in red there and for those with low screen visibility, the second circle out is 30 kilometers.

Anything red there has significant radiological damage that could use or could result in the land being non-useful for quite a few years. And so the impacts of our energy choices and the U.S. energy fleet from nuclear context is again one of the choices that we as a nation have to make.

So before moving on to our next speakers, I just wanted to put up this last slide with a bunch of the references from the report because clearly as we start talking about myths and the benefits of wind we really need to be careful that kind of any statements that we do - that we make about wind technologies, we have the capabilities to reference them back to really good science. Again, getting back to that issue of there are lots of different viewpoints out there.

And the key is addressing the people who have their mind open to discussion and providing them with true scientific information that helps them make clear decisions on what they want to do moving forward.

So again, if you have any questions about the presentations, please hit the Q&A at the top of the screen and type in your question. And therefore without further ado, we will move on to Ed DeMeo who is going to talk about integration issues of wind.

Quickly before Ed jumps on, just want to give him a quick introduction. Ed DeMeo has been a feature in the wind industry for quite a few years and provides lots of technical service and as a strategic advisor to many different programs including the Department of Energy, the utility wind integration groups, Wind Power America, the National Wind Coordinating Collaborative, the New England Wind Projects and probably about 40,000 other things.

He's been doing this since 1999. Prior to that he spent over 20 years working at EPRI. And so for someone in the wind space, he has a huge wealth of knowledge about the power sector in its entirety. And therefore getting a presentation from Ed on the integration of wind is a joy for all of us.

So Ed, thank you very much.

Ed DeMeo: Well thank you Ian. I'll try to live up to all that. As Ian indicates, I'm going to address a couple of the prominent myths that are associated with the integration of wind into the electric power system.

There. For topics here, first I want to say just a little bit about what's the appeal of wind power, what are its benefits. Ian has touched on that already quite a bit so I won't go into that in great detail.

And then we're going to talk about what's needed for successful integrations of wind into the electric power scheme. And then finally there's been lots of questions raised about, you know, will the expected environmental benefits from wind power actually be realized. So I'll close with some discussions of that.

First of all, the benefits. What's wind power's appeal? Again, Ian has mentioned this. I think you all know these. It's affordable, clean, domestic energy. We expect reduced fossil fuel consumption at associated reduced emissions as a result of wind.

In operation there's very little if any water consumption. And there's a whole range of economic development benefits, which actually will be the subject of your next Webinar here. Lots of more information on this available at the Web site that - it's shown there. I'm going to be focusing primarily on those two that show in the yellow there. That is having to do with fossil fuel consumption.

Okay. Now I think most of you probably know that wind power does present some challenges to the people who operate the power system because they - instantaneous spaces have to maintain a balance between the demand for electricity and the generation from their suite of generators.

And wind has some natural characteristics that make that little tougher. Wind has variability over timeframes of minutes and hours. And, you know, that complicates this balancing process so that other generators on the system have to compensate for what the wind is or is not doing. Wind also has uncertainty on a day-to-day basis and that complicates the day ahead planning for the people who have to operate the power system.

On the other hand, these are not new problems. Utilities are used to dealing with variability and uncertainty in the load that they serve. So wind just makes that problem a little harder for them to do. The distinction is one of degree, not one of kind.

Okay. So what do we need then for successful integration of wind power? Well some people say well if you put in a megawatt of wind, you got to put in a megawatt of something else to back it up. Well, that just isn't true because it isn't the way the power system operates.

All the power plants on the system work together. They support each other. And if one is going up or down, another power plant or group of power plants will compensate for that. Wind just becomes a part of that mix.

Now at any one time there are reserves available to the utility. They might be in the amount of say 10 to 15% of the low at that instant. And those reserves are there to take care of unforeseen events. So a power plant that might go down or a transmission line that might go down. So those reserves are there again to take care of a bunch of different variations including those from wind power.

Now but if you have a substantial amount of wind on the system, that does increase the amount of reserves that are required and in turn that increases the operating costs of they system. And those incremental operating costs generally folks refer to those as integration costs associated with wind.

Now another thing that folks say - many folks say is well, wind and all its variations, you've got to have energy storage on the system. And that isn't true either for pretty much the same reason as the previous bullet there. It's the rest of the system that takes care of the variations.

On the other hand, storage would be valuable to the system if you had it and if it was affordable and in some cases it is. But if you have storage, you would operate that as part of the complete power (plant system). You wouldn't tie it to any one specific power plant, wind or any other. That would be sub optimal to do that.

Okay. So what do we need for successful integration? Well, what we need is lots of flexibility in the power system. And there are lots of different ways to get that flexibility, many components of it. For example, one is just in the operating strategies of the whole power system.

One example would be sharing of reserves among neighboring utilities rather than trying to do it all yourself. There's a benefit from doing that and I'll come back to that a little bit later on.

To do that sharing requires connectivity, it requires wires and some of those wires are already in place. We need to use them efficiently. And in some cases additional wires would be necessary. We don't have to string them all over the country but judiciously they're likely - there is a requirement for additional transmissions.

Another source of flexibility is voluntary load reduction at critical periods. So called demand response. This is becoming quite prominent throughout the country. Quite a significant resource there and that provides valuable flexibility.

The other thing that's happening as time goes on is that the generating units themselves, the fossil plants, the natural gas plants in particular are becoming more flexible. They're becoming more able to change their output rapidly without significant cost or maintenance problems. So as time goes on the systems will get better and better from that standpoint.

And of course another element of flexibility would be storage. If you have affordable storage and operated on the system level, why that is a very nice source of flexibility.

Okay. Now the other thing we need for successful integration is good wind forecasting because that allows the utilities to make better decisions on several different timeframes. And then you might ask well how good is the wind forecasting capability. Now look at the little box there on the bottom.

The error for hour ahead prediction for a single plant today is somewhere in the range of 10 to 15%. On a day ahead basis it's higher, 25 to 30%. Turns out though if you average forecasts over a large region with plants over, you know, a state or a couple of states, there's an averaging affect that occurs because the wind isn't doing the same thing in every location at the same time.

And these forecasts actually become - or the errors let's say might be reduced by as much as half from that averaging. And forecasting is worth quite a bit. One of the recent studies done in New York for example estimated that the

value of today's forecast is somewhere on the order of 1 or 1.5 cents a kilowatt hour. So there's a lot of money on the table to get it right or get it close to right.

You can do even better with a perfect forecast, which nobody will ever have. But in fact the benefit from the perfect forecast is really not so great compared to what we can do right now.

Okay. Now over the last decade there have been a number of studies of integration of wind in actual utility systems focusing on these integrations costs. And what's happened as time goes on, as people have looked at larger and larger regions with more and more wind, getting up to 30% of energy and beyond in power.

And what's come out of this whole raft of studies is kind of a - is a key result shown in yellow there that in general the wind integration costs aren't zero but they're not a killer. And they turn out to be on the order of 10% or less of the wholesale value of the wind energy. In other words, under about a half a cent a kilowatt-hour.

And this holds up even as you get the higher penetrations and larger systems. And a couple of good reasons for that. One is that as you do that you're (agracating) wind over larger and larger regions. And as I mentioned a minute ago, the variations tend to average out to some degree so that eases the integration issue.

And the other is that as you go to these larger regions, the utilities are sharing their reliability responsibilities over larger and larger regions. And that also reduces operating costs by reducing reserve requirements. And that happens even irrespective of whether you're putting wind on the system.

What I'm showing here I'm -- it looks like some of the numbers got moved around a little bit but hopefully you can see where they go -- is the integration costs from a sampling of the recent studies that have been done around the country.

Integration costs are broken out into several different timeframes. But just take a look at the column way over on the right. Total impact here. What it's telling you is the integration costs for this wide range of studies with penetrations ranging from, you know, 3.5% all the way up to 34%. And what's coming out is this number of, you know, somewhat less than $5 a megawatt hour that I mentioned a while ago. So it's a pretty robust result.

Yeah. One of the things that is in play here is the reduction in reserve requirements as you go to larger and larger areas. Larger utility balancing areas. And what this chart is showing you here is a - take for example, look over on the far left.

If you're a utility of say 100 megawatts in size, that would be very small. It would be a small city operating by itself. And if you're isolated and you need to provide all your own regulation requirements, these are the reserves to deal with variations over, you know, seconds in a few minutes, turns out statistically this is from experience in Minnesota as it turns out. Statistically you would require nine megawatts of regulation.

Now on the other hand if you were are larger utility or you hook up with others such that you become 1000 megawatts in size, the regulation required only goes up by about a factor of three and similarly another fact of ten. There's another factor of three.

So by the time you get up to 100,000 megawatts, that would be twice the size electrically of say California. Your regulation requirement has only gone up to 300 megawatts. So there's a huge benefit from this aggregation of balancing areas.

All right. So that's in play. Factors like that are in play on this chart. Apologize here. The numbers don't go in the boxes but I think you can see where they go.

You're seeing results from two studies done in Minnesota, 2004 and 2006 they were actually on a previous chart but I pulled them out. And in 2004 the Minnesota Department of Commerce looked at the integration costs for 15% penetration by energy into one utility in Minnesota, Xcel Energy, and found an integration cost of $4.60 a megawatt hour.

Now to years later the study was repeated and done with higher penetrations and done with a larger footprint looking at the whole state of Minnesota. And the four major utilities operating together in redoing the integration cost study. And what you - what we found is that even with over twice as much penetration, 34% of wind, the integration cost was actually a little bit less than showed up in that earlier study.

So, you know, what's going on here? Again, it's this aggregation affect. Averaging wind over larger areas and then having a larger utility footprint and more generators to pick from to do the balancing and the reduction of reserves that come as a result of that. So again, huge benefit of aggregation.

So now the big question of - the studies are saying we're going to get good environmental benefits but the question is would they really be realized? Now we got to look for a minute into how the utility provides reserves. They don't

do it with additional power plants. They actually do it with existing plants that are operating already.

But to get some reserves they would operate these plants a little bit off their optimum. And in fact this chart here gives a little schematic of what's going on.

Suppose we have 100-megawatt power plant. You now, it's designed to operate at that level. Its efficiency if it's a good plant might be 45%. If we decide we want to provide ten megawatts of reserves with this plant by dropping it off to 90 megawatts, then what you see here is the efficiency drops a little bit.

So at 90 megawatts I might think I should be saving 10% of the fuel while I may only be saving 9% of the fuel just because of this efficiency reduction. So there's an impact there. Going back to that previous slide here. Because of that affect there's added fuel consumption, there's added emissions on a relative basis.

Some folks have made the claim well this is such a serious problem that that's going to wipe out the emissions benefits of wind. Now this is an area that folks are just beginning to study in detail. But work so far indicates that this is - there is an impact for sure but it's maybe a 5 or 10% kind of thing, not a 50% or a 100%. So the idea that we're not going to get significant emission benefits is just not holding up.

The other thing that we need to be concerned about is that with the variations due to wind, these fossil plants will be cycling up and down a lot more and that will increase wear and tear on them. There will be increased operating and maintenances costs.

This is an area that's really now just getting under way but we do have early results from one study which is suggesting that yes there's an impact here but it's small addition to the integration cost that's already been calculated.

All right. So where are we today? Just take - look at example of one major utility that has quite a bit of wind. It's Xcel Energy operating in both Minnesota and Colorado.

They're at now approaching 10% of their energy - retail energy from wind. And they've become comfortable enough with wind that they are actually changing their generation expansion plans for the future. They're canceling coal plants, replacing those in their plants with combinations of wind and natural gas.

And they see that as economically preferred. They see it as environmentally preferred. And they're learning how to deal with these natural variability and uncertainty characteristics of wind power.

So but now what about these - the skeptics that are out there who are saying, oh, it really isn't going to work all that well. You're not going to get the environmental benefits you expect. You know, how do we address that?

Well of course the last few slides I've been talking about I've attempted to address that. But the real answer to this question is what are the utilities doing? And we've got a number of power utilities around the country. I just showed you the Xcel example -- there are others like that -- that are relying more and more on wind for a significant portion of their electricity.

Now these aren't fly by night organizations. They have tremendous responsibilities to keep the lights on, provide reliable power. And they're saying, you know, we think we can do - we know we can do this with wind.

Their experience is showing that wind can play a substantial role in their areas. They measure their emissions and they know that their emissions are down as a result of wind installed in their system. So that's really the answer to the skeptics. It's that what's actually happening refutes the claims that they're making.

So that's pretty much what I have to tell you. There have been a series of issues of I triple Es, Power and Energy Magazine over the last several years that have gone into great detail on these integration questions and other related questions. Many of you have probably seen these magazines. There's three of them already.

One more is going to come out in November, December of this year, 2011 dealing with these same issues. So lots more information available. Much of this is also available on the UWIG Web site, Utility Wind Integration Group shown down there on the slide.

So that's what I have and Ian I will turn it back to you.

Ian Baring-Gould: Quickly again before we move on to Ben, if you have questions, please don't hesitate to hit the Q&A at the top of the screen and type in your question. We've gotten a number so far that we'll get to as soon as we go through Ben's presentation.

So without further ado, Ben Hoen is our next speaker. Ben Hoen is a researcher at Lawrence Berkeley National Laboratories and has done a lot of

investigations on a kind of individual and community power systems looking at both wind and solar.

In 2009 he started a study to really try to address the issues of property value impacts around large wind development. And Ben is here to give us an update of that initial research. So thank you Ben and go ahead.

Ben Hoen: Thank you Ian. It's a pleasure to be here. And just great presentations from both of you. I hope mine can rise to that level. I'm talking about a very specific subject even though Ed covered a big area of research and a tremendous amount of studies. I'm going to focus just on what I know best.

Thankfully I can report that there's a growing body of literature now on the subject of wind facilities and property values. And so I'm going to summarize some of that literature today. And even though I won't be able to go into depth, hopefully we'll give you a picture of what I think we're seeing now.

And I'll put forward a paradigm to frame the presentation today. And that is of a valley. So in 2007 Maarten Wolsink began finding that for wind facilities as it was found previously for other disamenities such as high voltage transmission lines and railroads.

Folks who live near proposed projects showed their lowest level of support for projects after the announcement but prior to construction. And then after the projects were constructed, their support returned to more normal levels. And his results are supported by others.

And one quick example of this is some - one that's in the Northeast, James Palmer survey. Folks living near the Searsburg Wind Facility, which of course has been around for a while. He found that the pre-construction levels of

support for this project were consistently lower than the post-construction levels.

Now why is this? In this period between announcement and eventual construction, the impacts are difficult to quantify and folks who have many reasons to protect their community, as they know it will often take a risk adverse stance and expect the worst, which is why it's assumed that support is generally lower.

Two things to note from this. Oh, I should also point out that of course it's impossible to determine exactly what a wind facility looks like until one's built even though you hope that it's presented in a way by the developer so everybody often believes the worst.

So two things to note. First I'll propose that this sort of valley would exist for the housing market too. That buyers and sellers of homes would take the same risk adverse stance as those surveyed in the survey's I've presented here. And evidence of such an affect does seem to be emerging and that's what I'm going to talk about today.

Secondly, I ask the folks on the line to consider when would the vote be cast to approve or deny a permit application. And the answer is somewhere near the bottom of that valley. So possibly today's discussion should be framed as how to fill in the valley. But more on that later. Back to the literature.

So I'll start with the work we did at the lab that was completed in 2009. It was a multiyear project. Many of you are probably familiar with this report. And those of you who are not, I would direct you to the Web site which I'll show at the end of our presentation were you can get the report. I'm not going to be able to go into much detail about it today.

I will quickly summarize the research though. It - we looked at 7500 transactions across nine states, around 24 wind facilities and importantly 125 of the transactions we analyzed were within a mile of an existing turbine at the time of sale, which still stands as the largest group of homes in that distance band that have been analyzed by any of the work I'm presenting today.

And the work - it's important to note concentrated on the post-construction epic. We were - sort of considered ourselves, you know, myth busters. We were trying to figure out whether homes that sold after wind facilities were erected were impacted by that facility. And so we concentrated on the period after the wind facility was in and operating.

In that period despite a variety of tests we found home values near the turbines were statistically indistinguishable from home values located further away. And this indicates that if affects in our sample do exist they were likely to be fairly small and sporadic for the homes located near the turbines. Oops. Have to press this button.

So turning now to a specific model in the analysis and I think there were 18 different models we looked at. This one slide if we could pick one model that summarizes the entire report best.

This figure describes a comparison of sales values of homes located at various distances from the turbines such as inside of one mile, between three miles and further away and over various development periods such as in the pre-announcement period and the post-announcement and then post-construction period as shown on the X axis.

Each of the points on this figure represent an average affect as compared to the reference category of homes, which are homes that sold more than two years before the wind facility's announcement and which were located more than five miles away from where the turbines were eventually located.

So this reference group of course we believe is highly unlikely to be influenced by the wind facility that eventually was built. So we thought it would be a good reference case to compare to. The average prices that are shown on this figure are determined after controlling for differences between the characteristics of the home such as square feet and acres.

And additionally prices depicted here are adjusted to house price inflation over time. Therefore if we did our job right and no affects exist, we would expect to have straight lines moving off to the right saying effectively there's no difference in prices between the reference case and the homes that sold in different periods of the development process and at different distances from where the turbines were located or will be located.

Now all that seems to be the case for all the homes outside of one mile. But inside of one mile we find a slightly different affect. We find depressed values prior to the announcement. Now those are compared to homes outside of five miles. And then we find continuing along that curve, the blue curve, that values became even more depressed after announcement but then appreciated after construction to more along more normal levels.

Now I want to point out that the focus of the research that I'm presenting on right now concentrated on the post-construction affects. And based on their pre-announcement levels, the homes within a mile did not show any apparent adverse affects once the turbines were operational. And for that research that's

where we ended the analysis. But we ended up looking back at this issue in a following paper. I'll turn to that now.

So the same data that was used in the report I just showed were used for a paper that has not been accepted and will be published in the fall in the Journal of Real Estate Research. And for this paper we conducted some additional analysis on those homes within a mile.

For the post-construction period, we also did other analysis and again we found a lack of statistics evidence of homes that were near the turbines after construction and operation. You know, basically reinforcing this question of valley and how sales values return to more normal levels.

So in the period prior to construction, we found some important weakness to our previous results. Specifically we found that the shape of the curve, that blue curve, were driven by fairly small groups of transactions. And through a variety of different sensitivity analysis, we believe now that a U-shape curve might be more appropriate for that curve.

In other words, the ends of the blue - the ends of the blue colored curve of homes within a mile are quite sensitive. And where other points in the curve and for that matter other curves are fairly robust, those points are not.

So - oh also I should point out that the announcement date that we had previously thought was pretty solid, we sort of gave another look at that and realized that it might be a bit too - it might not be appropriately placed in time.

Specifically the announcement date referred to when the facility entered the public record but we believe that folks in the community might actually be

aware of the facility well before it's actually announced in the media or in the public record. And so maybe that line is to be moved further to the left.

So in combination for this paper we concluded that our data might be telling us that there's a significant dip in values after announcement of the facility yet prior to construction and that after construction operation the values returned to more normal levels.

Now without more data we can't be sure of this interpretation though a number of other studies have looked at this possibility. Specifically Steven Laposa and Andrew Mueller of Colorado State University were the first to investigate this directly for wind facilities. And they were not able to pick up an affect but they highlighted the fact that wind farm announcement would be an important date to investigate.

Jennifer Hinman of Illinois State University took a much more exacting look at this phenomena in a very well done paper she published for her Masters thesis. She concentrated on one very large facility of around 218 turbines that was built over two phases in McLean County Illinois.

She found strong wind - strong post-announcement adverse affects in the range of negative 6 to negative 12% for homes that were close by but that also those affects were erased after the wind facility became operational.

More recently Martin Heintzelman and Carrie Tuttle of Clarkson University conducted an analysis of affects that facilities have on property values that are located on the perimeter of the Adirondack Park in New York State. And I think I have a slide here. Yeah. That's where the facilities - those are the three counties they looked at, Lewis, Franklin and Clinton.

And they found that when they turned their focus to the period prior to operation yet after the facility had been announced that adverse affects were present in the range of negative 6 to negative 16% inside of one mile. And this was the case in Clinton and Franklin Counties for which they had very few sales after operation. Those facilities are relatively recently built.

For Lewis County where the Maple Ridge Wind Facility is they had a good amount of data following the facility's operation. And they were not able to discern a statistical difference in house prices closer to the turbines. Now both of these indicate potentially a valley affect. This work is ongoing. I don't believe they've finalized their draft at this point. But this is what the most recent draft highlighted.

Finally we have Jason Carter's Masters thesis work from Illinois State University. He investigated Lee County, Illinois transactions that surrounded successive developments over seven years.

He did not investigate the post-announcement but rather concentrated as we did on the post-construction affects and was able to uncover any statistical evidence and affects exist in that period. So this provides further evidence that despite what happens post-announcement, post-operation affects are not showing up.

So in conclusion and looking at all these studies together, support for wind facility has been found to be lowest after announcement but prior to construction, which is when the permit is often voted upon. Analogously risks for property value impacts are highest when they cannot be accurately quantified in the period prior to construction and operation. But adverse sales price impacts are evident in the period.

After - based on that, we think that that's why adverse sales price impacts are evident in the period after announcement but prior to construction in some studies.

There is evidence that support for both sales - support for and sales prices near turbines improved to more neutral levels after the facility begins operation. And more to the point, and this is I guess the addressing the myth point, conclusive evidence of persistent post-construction affects from wind facilities have not been discovered this right now a variety of studies using different statistical techniques though often overlapping and more importantly different data sets.

And that ends - what do I have here? I have just this slide. I realize I don't have the link to the report here on the slide but you're welcome to contact me directly. And I suppose that your - Susan and Ian you're going to have these available to others. If you do, here are the references of the reports that I covered today. Thank you very much.

Ian Baring-Gould: Thank you very much Ben. Just to restate that not in all cases we don't have the presentations themselves but the audiovisual Webinar is available on the Wind Powering America Web site. It takes us about two weeks to get it up there but after that all of the - everything that you've seen and heard over the last hour you will be able to see it there. And in some cases we do have the presentations up there.

Getting to a number of the questions that we got. A couple of quick ones. In my presentation I noted the JEDI model, which is the Jobs in Economic Development Impact model. It was created at - well as a Doctoral thesis to NREL. And it's available on the NREL Web site.

You can download it and use the model to do your own stuff as well as there's lots of documents that are out there that have used the model. It's based on the (in plant) model, which is a national planning level model that is out there.

Another question from (Paul Measursmit), a couple of them. The first one is if wind is so attractive and economical, why aren't most developers - why are most developers and manufacturers foreign? I think that's to a degree a misnomer. The manufacturers - actually the largest manufacturer in the U.S. is GE. They have about 50% of the market in the U.S.

The reason that the manufacturers - a lot of the manufacturers are foreign is because Europe has been very active in the wind space and the U.S. hasn't had a very developed wind market except for the last couple of years and it takes a long time to develop a manufacturing base to be able to support that. And so that's why a lot of the manufacturers are foreign.

Most of the developers in the U.S. market are actually U.S. So even though the turbines are - some of the turbines are imported again, as I said, about 40% are imported, most of the developers are actually U.S. developers.

There is a - he does have a question in regards - this is directly to Ed and I'm not sure if you can talk about this. But if you could talk a little bit about the excess wind that BPA is seeing up in the Northwest and how long or what the issues are around that.

Ed DeMeo: Yeah. I can say a little bit about that. Yeah. It's a - I mean it's a practical problem. It was a very high water year in the Midwest - I'm sorry, in the Northwest and has been elsewhere in the country as well. And I, you know, my sense is it's going to become not an anomaly but the norm.

But anyway, too much water and BPA can't simply let the water spill over the dams because that results in too much nitrogen in the water on the other side and that kills fish. They get the bends basically.

So from an environmental standpoint they've got to do something. So what they've chosen to do is curtail the wind plants rather than the hydro plants and let the water go through the generator - through the turbines, which avoids that problem that I mentioned.

Tough nut to crack. It's just something that has to be dealt with. It's over now. This went on for oh, a month or two. It is not past. The wind people claim - or the wind people estimate that they lost about 6% of their annual energy production as a result of it.

But it's just how it is. And these are things that the power industry in general are going to have to deal with. If there were more transmission lines out of the Northwest into the - say inland Northwestern down into California - more capability, the wind energy could have been sent elsewhere. But right now there is a deficiency of transmission.

Ian Baring-Gould: Great. Thank you. Thank you Ed. Another question from (Sally Griffith) and this is to you Ben. In the housing study did you look at whether there was an affect from more controversial wind projects on housing prices?

Ben Hoen: No we didn't. It's an interesting question whether - so controversial might be ones that are having difficulty getting permitted and finally do get permitted or maybe ones that had been permitted and operational and have more issues around them.

No we didn't study that. It's a very good question. I would also post that another good question would be the degree to which the press around those facilities impacts housing prices. If there's a lot of hype around adverse impacts, then it would likely be that home prices around them would be impacted as well.

Ian Baring-Gould: Great. (Paul) had another portion of his question which was getting at the potential renewal of the 1603 cash grant. And I'm not sure if either of you two have comment. My sense would be it's anybody's guess and no one is expecting or not expecting the grants to continue. Do either of you have a thought on that?

Ed DeMeo: I think you've got it.

Ben Hoen: Nothing more to add.

Ed DeMeo: Yeah.

Ian Baring-Gould: Another question in relation to offshore wind for integrating whether there's a - kind of looking at the cost of energy and the integration of offshore wind. Do either of you know of any studies that look at integration issues or integration cost as well as the land or value impacts of offshore?

Ed DeMeo: Yeah. This is Ed. Yeah. It's an area that's just beginning to be studied. Although there has been one study done by the independent system operator in New England, ISO New England, did an integration study in connection with the Cape wind plant which is I don't know, somewhere on the order of 250 megawatts I think.

And a conclusion they came to was that there was no difficult issue to deal with with respect to that plant. But more work is needed looking at higher concentrations, higher penetrations of wind coming in at a small number of points on land. And that's likely to be an active area over the next few years.

Ian Baring-Gould: Right. Ben, I know you haven't done work in this area specifically but the University of Delaware has. Could - can you comment on that?

Ben Hoen: Yeah. They've done surveying around this issue because of course we don't have an actual wind facility to test whether there have been impacts to land values.

They basically try to estimate the affect per person and have found that there is an affect that people expect based on survey responses in the sense that the closer the turbines are, the more people are willing to pay to have them - well, I should say the further turbines are away, the less people are willing to pay to have them removed. Basically there is an impact perceived.

One - and so that's expected. Basically people want to see them further away. There's no reason why you wouldn't assume that. One part of our analysis was to look at the visibility impacts alone and of course these were inland facilities. They're different. And they're not on - across water. They're across grass and mountains and things like that.

But we did not find any evidence that impact - that views alone impact property values. And if you kind of compare what the folks at University of Delaware found where they're looking at an impact of around $35 per person per year and sort of try to put that in real estate terms, you can recognize that an impact would have to be pretty large - much larger than $35 to show up in a property value study.

So it might very well be that we're finding the same thing. People do not want them near. They'd rather them further away. But ultimately it's going to not impact property values in an appreciable way.

Ian Baring-Gould: Great. Thank you. Ed, I know you're a California person so I'll address this question for you. This is from (Cathy McNeemy). Why does there appear to be so much resistance to taking steps to temporary shutdown or make necessary changes to wind farms that are notorious for bird kills, i.e., Altamont Pass?

Ed DeMeo: Well...

Ian Baring-Gould: It might be a question for a later Webinar when we're talking with...

Ed DeMeo: Yeah. Yeah. It's interesting. The Altamont Pass is far and away - it's kind of the poster child for the people that are concerned about avian impacts of wind. And it turns out to be really the only wind area in the country that has had that level of impact. Unfortunately we have golden eagles in the area as well.

So the wind industry and the environmental folks have worked real hard over the last decade to try to mitigate the problems there. Many of the smaller machines have now been changed out to larger machines and fewer, less of them. So the indications are that that has helped quite a bit.

So it's just unfortunate that that area has gotten so much press because most of the other developments around the country just haven't seen anything like that at all. So I don't know if that addresses the question but...

Ian Baring-Gould: Yeah. I think another thing that might be - that I have heard though is that because of the issues with permitting in California to try and open up a debate in regards to kind of re-permitting those plants would be a monumentous task. And people haven't really wanted to delve into that.

But why don't we hold that question in I believe it's two months we're going to be talking about environmental impacts of wind and that would be a great question to bring forward there.

Another question from (Sarah Wolf) and we'll take a few more questions. Still have about 75 people on. So we'll go through all the questions we can. Another to you Ed.

The Midwest is very interested I assume in wind though not very successful in increasing transmission capacity to connect the Dakotas Western wind to the Northeast, how do you feel this would affect the nation's energy industry? And then how do you feel the different regions would react to the implementation of transmission?

Ed DeMeo: Yeah. Yeah. That's a really good question. The price of energy in the Northeast - price of electricity retail price is considerably higher than they are in the Midwest. So there's an economic driver to develop the wind energy in the Midwest and ship some of it East.

That actually would result in reduced electricity costs for people in the East. However, there's a lot of opposition from the folks in the East to doing that for several reasons. One, they're concerned that the transmission lines required would be, you know, subsidized or would be paid for by them more so than the other people who are actually generating the wind energy in the Midwest.

A bigger concern is that folks on the - in the Northeast really want to develop their offshore wind. At least this is what we hear a lot. And there's a concern that if the nation moves in the direction of sending wind energy from the Midwest to the Northeast then that's going to get in the way of the drive to develop offshore wind in the Northeast. So that's a big concern on the part of these folks.

However, the studies that have been done looking at large amounts of wind in the entire Eastern part of the country will show or have shown that if we really want large penetrations of the wind, we need it all. You need to move some of that wind energy from Midwest to the East. You need to develop the offshore wind as much as you can.

So some of the concerns people have are really not founded but - not well founded but on the other hand there is an emotional issue there.

Ian Baring-Gould: Great. And since we have you on the line, a follow up question from (Candice Wheeler). Is there an organized effort to add more transmission infrastructure, which would improve reserve capacity on (national) (unintelligible) basis?

Ed DeMeo: There are several efforts. There's a group called WIRES. I forget what it stands for but it's W-I-R-E-S. Lots of members including utilities, some environmental organizations and their mission is to make this case really that the country needs an expanded backbone transmission system to do just exactly what the questioner asked there - commented.

And that is to in general improve the reliability of the power system in the country. And there's no doubt about it, there would be that benefit. However, there's a lot of opposition to transmission for, you know, a number of reasons.

And there's also a lot of opposition I mean within the states to taking a national view of transmission needs and transmission activity because, you know, it becomes a states rights thing. So there's a very strong demonstrated benefit from doing this, from having the backbone system, but there's an - just an awful lot of opposition.

WIRES is a group that's really pushing hard for this. They - you just Google WIRES and you'll get these folks. They produce a lot of information, have a newsletter. They're working hard.

Ian Baring-Gould: Great. Thank you. One question for you Ben. What are the real estate prices after announcement and permitting but during construction? And this is from gentleman, (David Himan).

Ben Hoen: Meaning what are the impacts that have - during that brief period of construction?

Ian Baring-Gould: Yeah, exactly. Do you have any data that demonstrates what housing values are doing at that point?

Ben Hoen: Unfortunately we don't at this point. I mean this is really early on. As I said in the beginning, there's only 125 transactions in our study and we have - inside of a mile and we have the most. So when you get down to really small periods of time, it's a little tough to pinpoint affects, so. Good question. Maybe there's something interesting there but we don't have any data to support an answer at this point.

Ian Baring-Gould: Yeah. That's great. A clarification for you Ed. Do you (depend) on the WIRES or is WIRES different than Wind on the Wires?

Ed DeMeo: No, it's different. Yeah. Wind on the Wires is a Midwestern advocacy group for transmission. WIRES is a national group. It's actually led by an ex-Commissioner of the Federal Energy Regulatory Commission, FERC. It's got a lot of high-level people involved and some major utilities that are members of it.

Ian Baring-Gould: Great. Great. Thank you. We have one last question about the footprint but I don't think there's anybody here that is able to address that question. So with that and us being 15 minutes off the hour, so to the gentleman who asked that question, sorry, I don't think it's appropriate for us to respond because we're not technology people. But if you want to forward that to us, we can try and get a response from an expert.

Again, thank you all for attending and hanging out with us. Again, thanks to Ed and Ben for taking the time to provide this information to everybody. We do have these Webinars every Wednesday of the month starting at 3:00 Eastern Time, which is 12 o'clock Pacific. The ones coming up are jobs in economic development on the 17th, offshore wind development which is kind of an update of what's happening in the wind industry and then in October wind and wildlife.

So please come and join if you have any interest in those. We will also be doing a Webinar shortly with - on the 2010 technology report from LBNL. So keep an eye on the e-newsletter to find out when that is. But we expect that within the next month or so. And that's always a very good update on the wind market itself.

So again, thank you very much. Have a very good rest of your July. And we'll look forward to seeing you all on next month's Webinar. Thanks very much and have a good day.

Ed DeMeo: Cheers.

Coordinator: Thank you for everyone's participation. You may now disconnect.

END